

Smart Skins and Tactile-Feedback Motion Control for Robotic Manipulators, Phase II

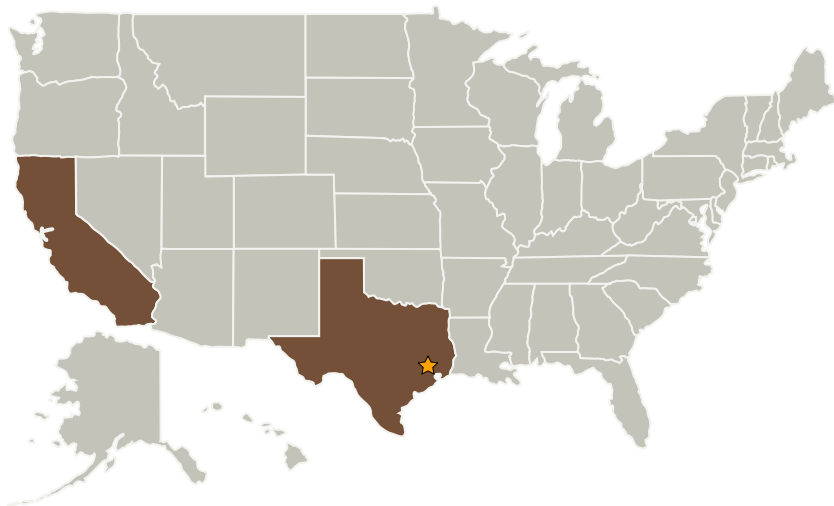
Completed Technology Project (2005 - 2007)



Project Introduction

Future high-dexterity robots promise enormous benefits to many areas of human endeavor performing operations difficult or hazardous for humans such as extra vehicular repairs. However, operating complicated tools and performing intricate repairs requires manipulators of great precision and excellent coordination. Human hands are very complex instruments with capacity for reception of and reaction to tactile stimuli for guidance in their functions. Integration of tactile sensing suites into robotic platforms (presently sensor impoverished) poses major technological challenges. The IFOS team, including well-known robotic experts from Stanford and JPL, proposes smart robotic skin including embedded Fiber Bragg Grating (FBG) sensors, custom-engineered composite skin materials, data interpretation and on-board decision-making. Phase I demonstrated feasibility. Phase II will deliver an FBG sensor-assisted manipulator prototype (hand and arm) based on high-resolution loading and artificial tactition. Immune to electromagnetic interference, FBG sensors are easily integrated into robotic structures, highly sensitive and multiplexable allowing many sensors on a single fiber. This will enable robotic manipulators with high-fidelity force control for precise object grasping, positioning and safe operation with astronauts. They will facilitate maximum functionality, minimum weight and size of extra-vehicular robots to extend the life and reduce costs of new generations of space systems.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Intelligent Fiber Optic Systems Corporation	Supporting Organization	Industry	Santa Clara, California

Primary U.S. Work Locations	
California	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.3 Manipulation
 - └ TX04.3.1 Dexterous Manipulation